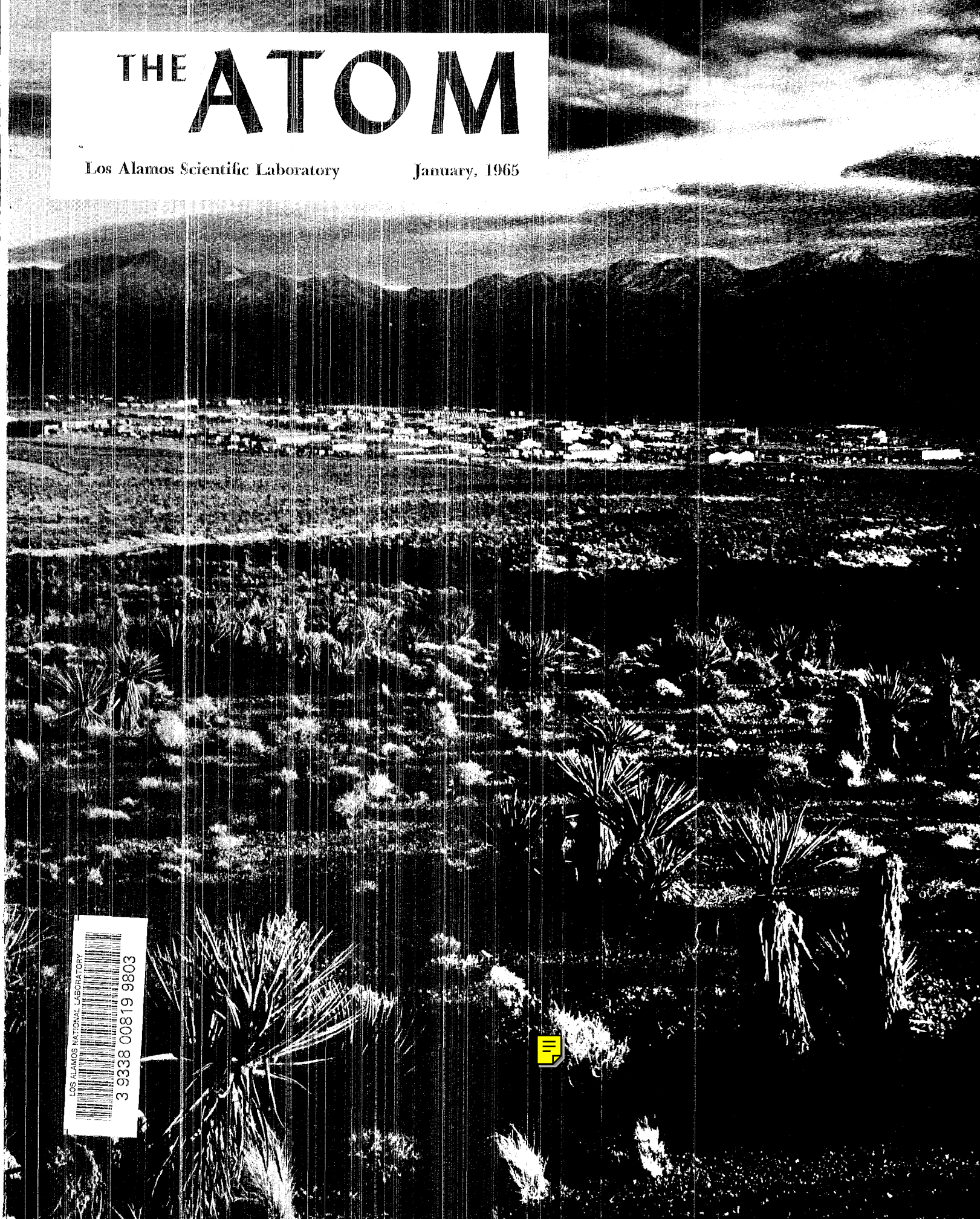
THE ATOM

Los Alamos Scientific Laboratory

January, 1965



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ON THE COVER: *Mercury, Nevada,* glistens in the late afternoon sun in this photograph taken by Bill Jack Rodgers. A story about this unusual and remote desert community begins on page 2.

Short Subjects

LASL is making preparations for its ninth annual Science Youth Day observance, to be held next month. More than 500 selected high school senior science students and their teachers from New Mexico, Colorado, Texas and California will be guests of the Laboratory for a full day. About half of the visitors will come on February 11, half the following day. After a briefing by LASL Director Norris Bradbury, the students will tour the Project Sherwood facility, Physics Building and the Health Research Laboratory.

A report paper on the LASL studies of the "mild monkey" that is being adopted for use in many laboratories across the country has been selected for publication in the "Yearbook for Veterinary Medicine for 1964." The paper, written by J. C. Hensly and Wright Langham of H-4, is titled "Comparative Fundamental Physiological Parameters of Macaca Mulatta and Macaca Speciosa."

Frank DiLuzio, AEC Field Manager at Los Alamos from September, 1952, to January, 1956, has been appointed by President Johnson as the new director of the Interior Department's Office of Saline Water. He will head up an intensified program of lowering the costs of converting salt water. He resigned from the post of staff director of the Senate Aeronautical and Space Sciences Committee to take the new assignment. DiLuzio, 51, has been associated with atomic energy and space projects since Manhattan District days when he served at Los Alamos.

Jack P. Livingston, 46, Associate J-5 Group Leader at the Nuclear Rocket Development Station, died at a Las Vegas hospital, January 4, following a lengthy illness. Livingston, who came to Los Alamos in July, 1951, was from Denver and the surrounding area. He transferred to NRDS in 1962. He is survived by his wife, Margaret, and two daughters, Jacquelynn Sue, 20, and Valerie Anne, 4.

The New Mexico Legislature has been invited to visit Los Alamos January 20 for a full day of tours and discussion concerning the Laboratory and community. LASL Director Norris Bradbury and AEC Area Office Manager Charles Campbell last month issued formal invitations to Lt. Gov. Mack Easley, presiding officer of the Senate, and to Speaker of the House Bruce King, in behalf of their legislative colleagues. On the lawmakers' agenda will be a briefing by Bradbury, tours of LASL's Stretch computer facility and the Physics Building, a showing of the documentary film "Ten Seconds That Shook the World," and a reception at the Laboratory Scientific Museum. Los Alamos County officials and the local Chamber of Commerce are helping to make arrangements for the visit.

A Place Called Mercury

BY DAVID SUNDBERG

Photographs by Bill Jack Rodgers

From a distance, when the brilliant desert sun is reflected off the roofs of its buildings, Mercury, Nevada, looks like a silvery island in a sea of rocks and yucca. As you get closer, the illusion quickly fades and Mercury becomes, for the most part, an austere collection of steel warehouses, wooden "temporary" buildings and trailers of every size.

The whole works seems hopelessly tangled in telephone wires and power lines, strung from a jungle of ugly poles.

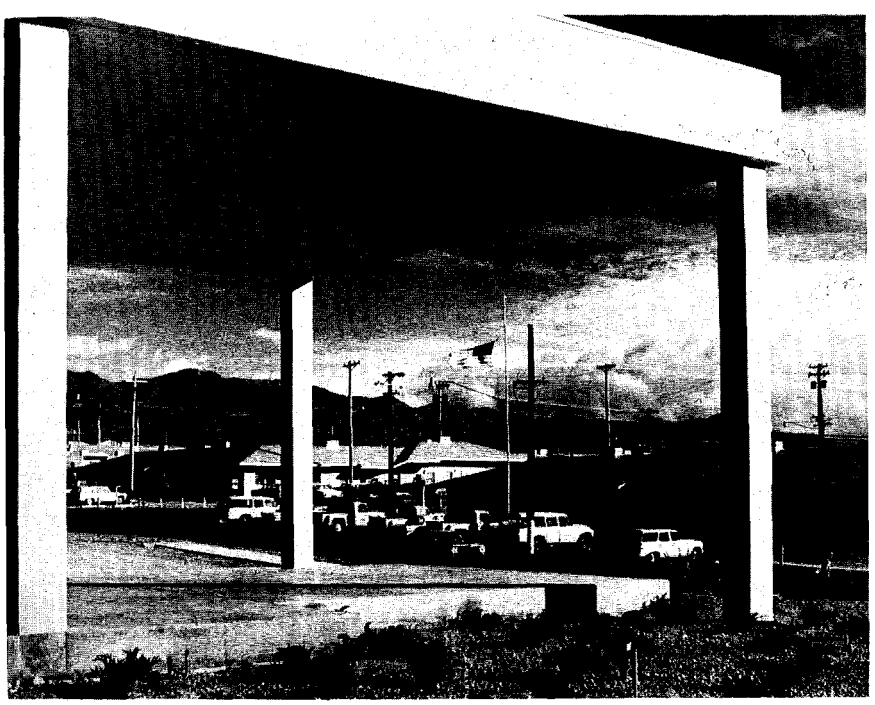
In some ways Mercury is like a town. It has a post office, movie theater, paved streets, even a steak house. Nevertheless, Mercury is not a town. It's a camp, a sort of center of operations for the Atomic Energy Commission's almost unbelievably big Nevada Test Site.

LASL, Lawrence Radiation Laboratory, and numerous other organizations maintain offices and warehouses at Mercury in support of their respective roles in nuclear weapons and reactor testing at NTS.

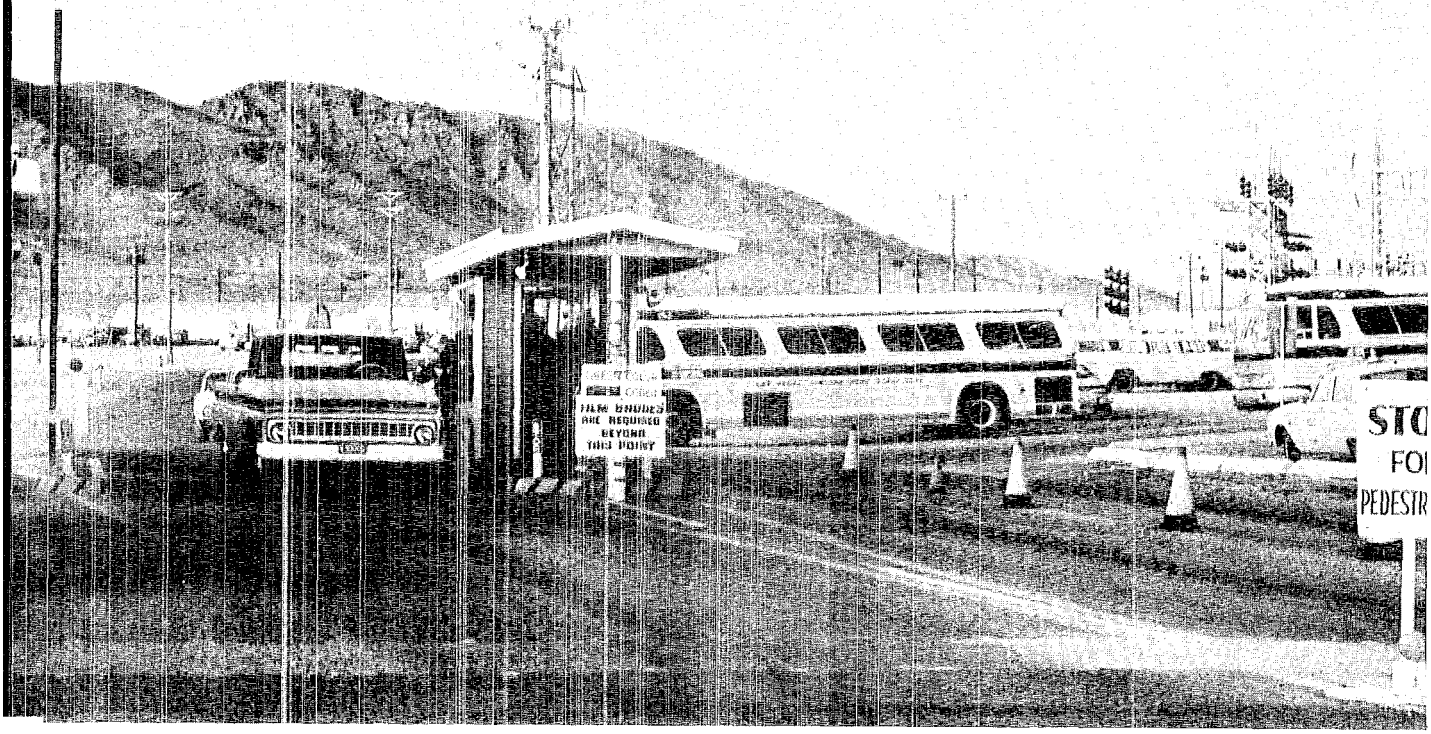
Located just inside the southern edge of the Test Site, Mercury is about 70 miles north of Las Vegas in a high and hilly region of a vast Nevada desert. The camp has been called "loneliness with a fence around it."

Like the rest of NTS, you enter Mercury only if you have business there and have a security badge to prove it. Mercury is entirely government-owned and is operated under contract by the Reynolds Electrical & Engineering Co., Inc., better known as REECo.

Born out of atmospheric nuclear weapons testing during the early 1950's, Mercury slumped for awhile during the test moratorium, sprang back to life when LASL began test-



The portico of Mercury's new cafeteria frames a view of some of the camp's other buildings.



Part of a caravan of Las Vegas commuter busses stops for badge inspection on leaving Mercury for the trip home.

ing Kiwi experimental nuclear rocket reactors in 1959. After underground weapons tests were resumed in 1961, Mercury soon became bigger than ever and it's still growing.

Of the several thousand scientists, secretaries, technicians and tradesmen who work in Mercury and the rest of the Test Site, most live in the Las Vegas vicinity and commute to work an hour and a half each way by car or in one of 54 busses which provide transportation to and from Las Vegas.

There is no family housing in Mercury, thus no families. Only a few hundred men and women, nearly all of them single, call Mercury their home. They live in small trailers or dormitory rooms and leave the Test Site only on weekends or holidays.

The handful of people who can be found in Mercury on a Saturday or Sunday are almost exclusively transient personnel like Los Alamos Rover or weapons men who fly out to spend days or weeks at a time during peaks of activity. The weekends at Mercury are the most

continued on page 9

The movie theater is a popular place to while away evenings at Mercury.

Mercury . . .

Continued from preceding page

dreaded part of their life at the Site.

To help alleviate the boredom of off-duty hours, the AEC in 1963 launched a $6,000,000 program of permanent construction, providing Mercury with its first permanent facilities of any kind.

Construction already completed includes a chapel, an eight-lane bowling alley with an adjoining Olympic-size swimming pool, and a new cafeteria which can seat 800 persons. A new Mercury post office opened last fall with dedication ceremonies attended by both of Nevada's U.S. Senators.

The most welcome new buildings are two dormitory complexes of 48 rooms each. That many more are to be built soon, according to Virgil Luckett, Camp Director and unofficial Mayor of Mercury. The new dorm rooms are single occupancy, have curtains on the windows, rugs on the floors. They aren't the Holiday Inn, but they are far better than the old army-style gloomy wood frame dorms they supplement but don't replace.

The PX is Mercury's general store. Among items for sale are tooth brushes, winter caps and magazines.

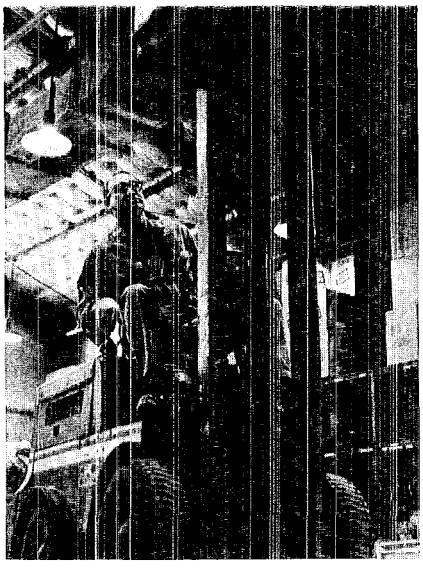
So far, neither the Government construction program, nor the Mercury Boosters Association has done much to quench Mercury's quasi-military atmosphere. Beds are "bunks" and come equipped with army blankets. The cafeteria is still better known as the "mess hall" and the dormitories are invariably called "the barracks."

The PX is simply the PX—it has no equivalent civilian name. The general store of Mercury, it's the place to go to buy everything from toothpaste to Seagram's Seven to the vast amount of reading material which is consumed during the long evening hours at Mercury.

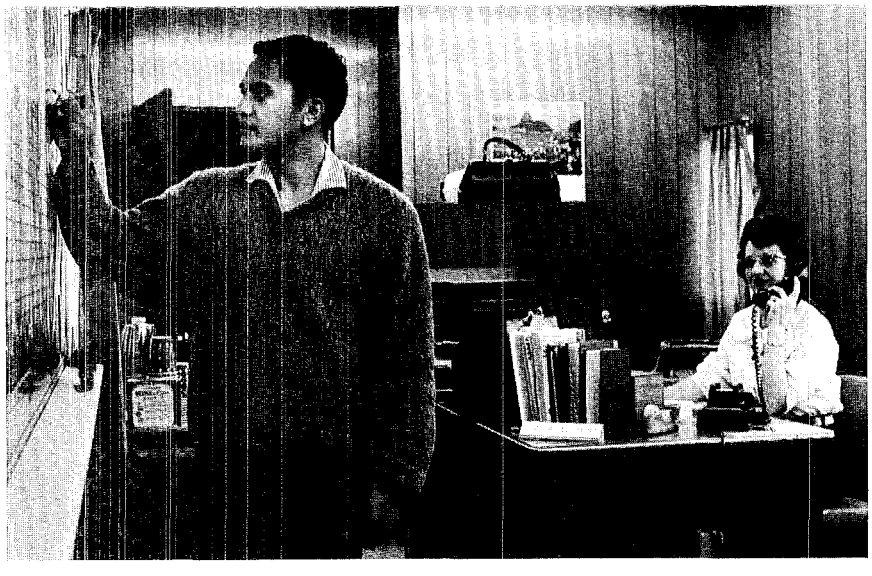
If you ask ten people for their opinions on Mercury, you will get ten very different replies, ranging from "sheer misery" to "I kind of like it here." Wiley Williams, a 15-year LASL employee who has worked at Mercury permanently for the past three years, expresses a common opinion, "You get sort of numb to it all after a while."

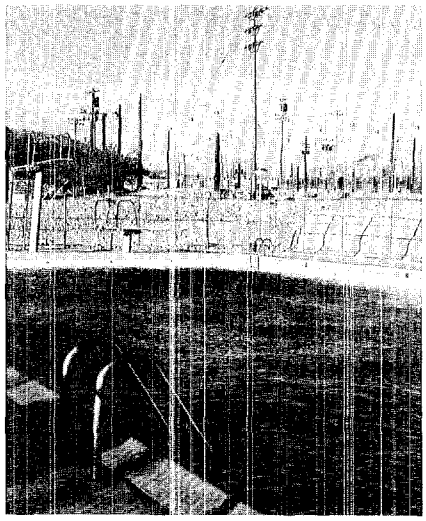
"The best way to get along in Mercury," you are told over and over again, "is to keep as busy as you can."

LASL warehouse operator Wiley Williams says of Mercury, "You get sort of numb to it."

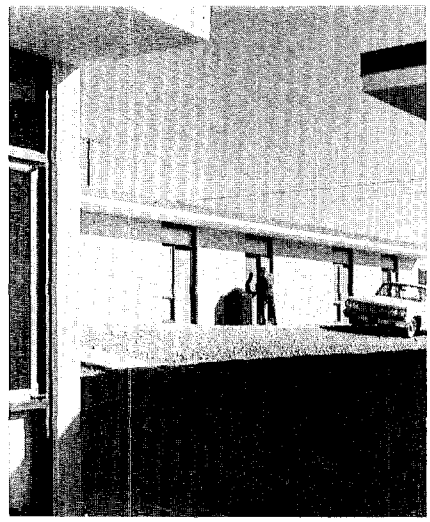


At the J-3 camp trailer, LASL's "nerve center" at Mercury, Joan Winter and Herbert Maunu make travel and lodging arrangements for a group of Mercury-bound Laboratory staff members.





A multi-million-dollar Government construction program is providing Mercury with a number of permanent facilities, like the Olympic-size swimming pool at left, and new dormitories of the type shown at right.



Regardless of his feeling about the camp itself, one must concede to a certain charm in Mercury's quiet remoteness and wide-open views of both desert expanse and several near and distant mountain ranges.

While they are in the minority, there are more than a few people who are actually fond of Mercury's camp life. They like its informality and the low cost of the trailer or dormitory housing, and point to a long list of recreational activities available in camp or nearby. Unlike those who commute from Las Vegas, a bona fide Mercury resident doesn't have to spend an additional three hours of every work day simply getting to and from work.

The commuters, on the other hand, seem satisfied with their lot. They don't particularly mind the bus ride and most have learned to catch an extra hour's sleep enroute. "Besides," says Joan Winter, secretary in LASL's Mercury camp office, "the ride provides a break between one's private life and his work."

Commuting from Las Vegas, however, make for a long day. Pat Provo, pretty assistant editor of REECo's bi-weekly employee publication, *NTS News,* finds she must rise by 5 a.m. to catch her bus to work. "If I want breakfast, I have to get up even earlier," she said. Pat walks a block to board her bus at 6:15. She arrives home 12 hours later.

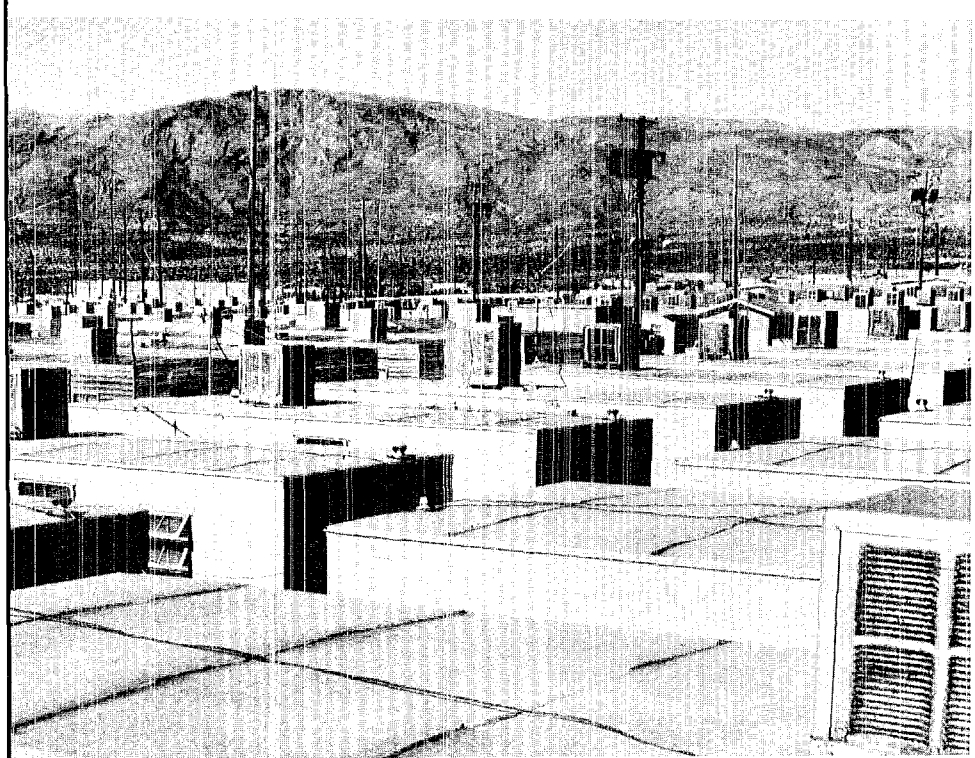
Pat admits that her commuting becomes tiresome but she says she prefers it to staying at camp. She tried living in Mercury, but after six months took an apartment in Las Vegas, mostly because she tired of eating out every meal.

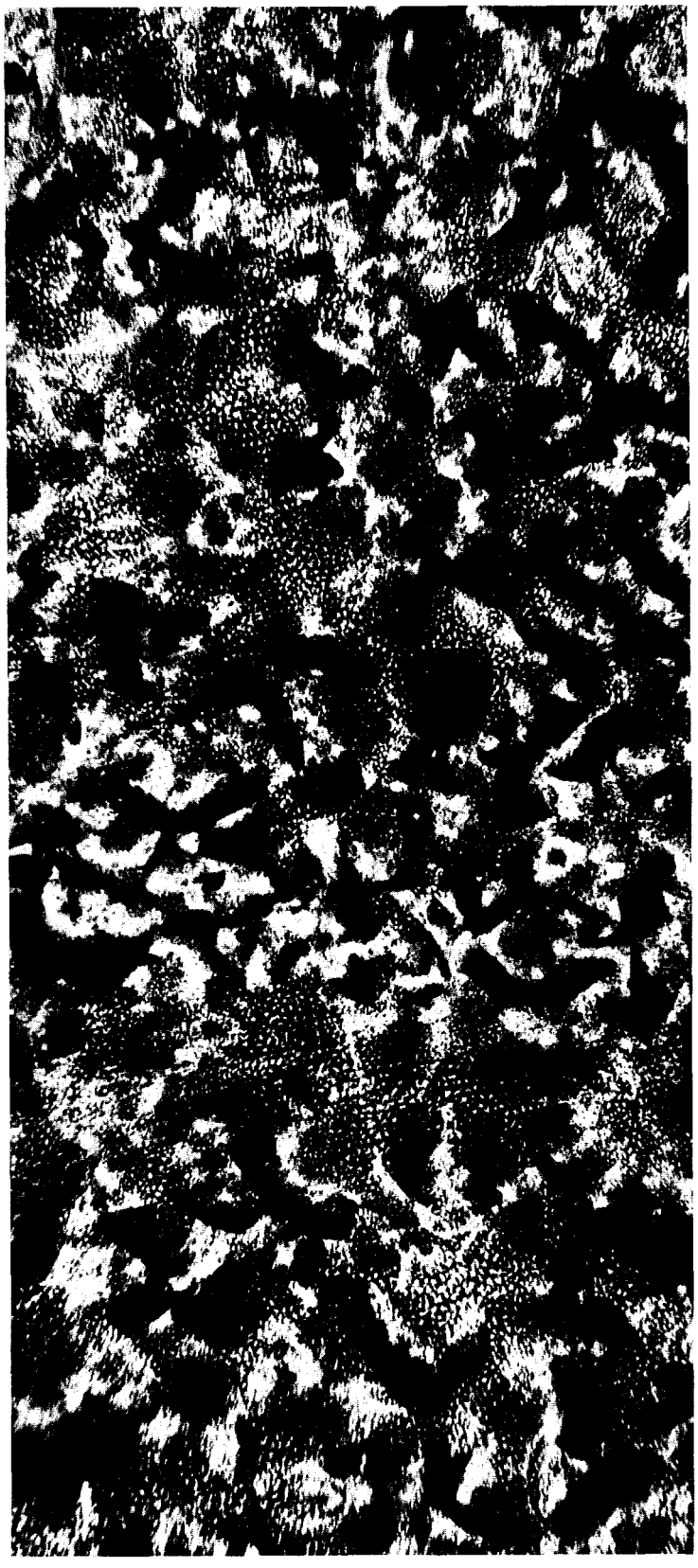
Eating at the Test Site, many agree, often becomes more a necessity than a pleasure. There are cafeterias both in Mercury and in the "forward areas," near the actual testing sites. The food is reasonably good at all cafeterias, but as one LASL scientist put it, "After a while, you get awfully hungry for a real home-cooked meal."

Cafeteria food, nevertheless, becomes an accepted fact of life at the Site, along with blowing dust, loneliness, the summer heat and winter cold.

Whether or not they like Mercury and its singular features, the people who work there generally admit to a certain sense of adventure in being a part of it. They recognize that the work they are doing there is important, and because of that, Mercury and the rest of Nevada Site is also important.

Air conditioned trailers in neat rows are homes for many Mercury residents.





It's not a painting, but a photomicrograph of two pieces of magnesium alloy bonded together by a friction weld.

But is it Art?

They materialize in images alive in expression value, haunting reminiscence and complex nuances. Springing from an inner necessity, their mystical, almost coprolitic qualities find expression in bold forms to achieve frozen motion.

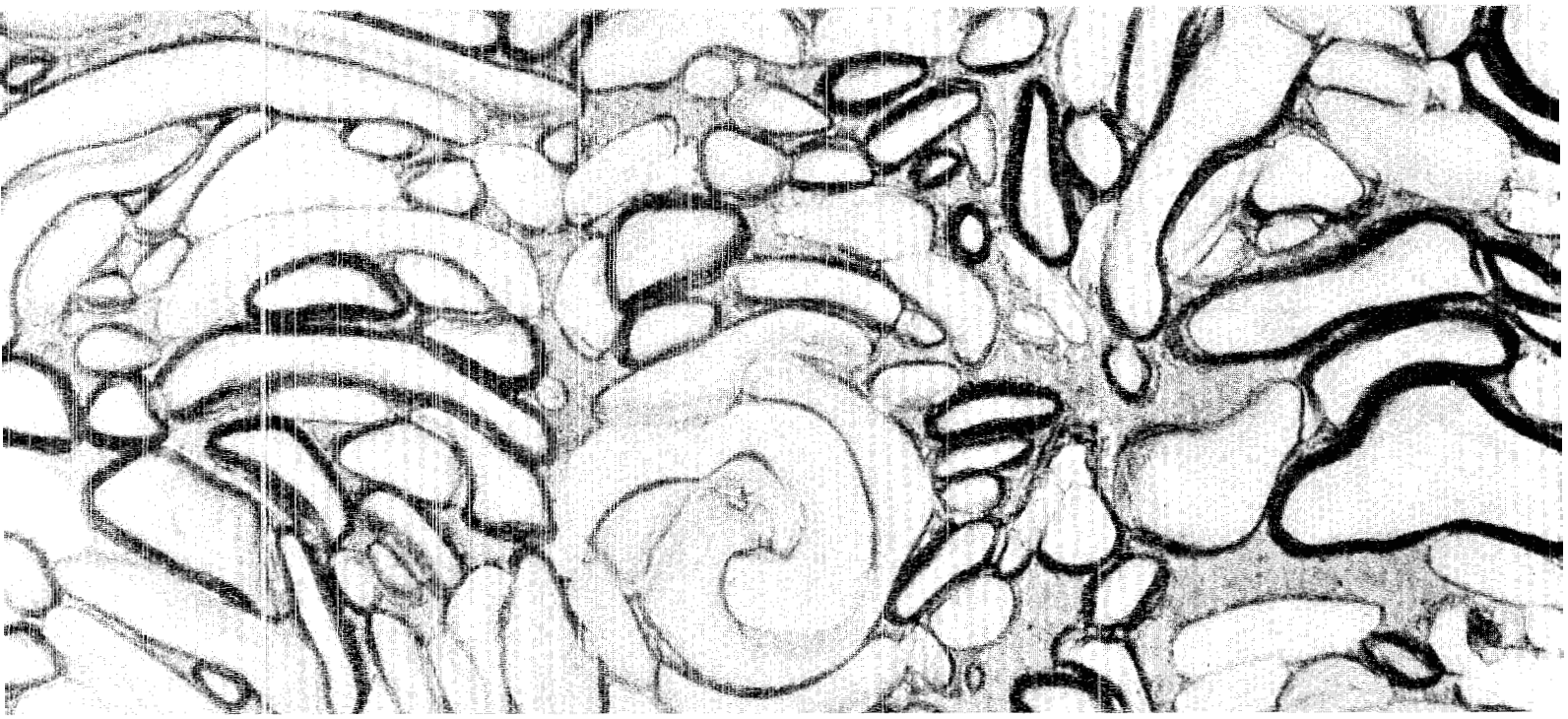
But is it art?

No, as a matter of fact, it is not.

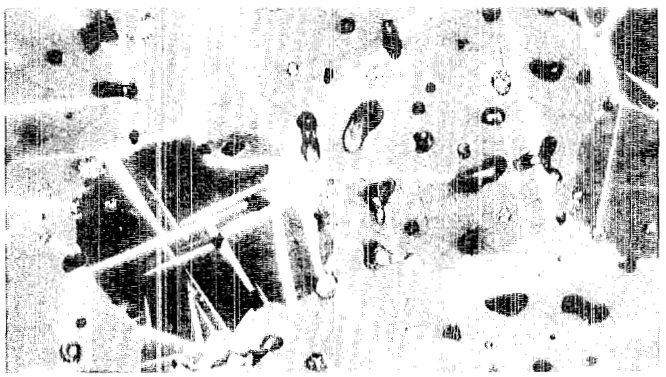
Though the art world lexicon could apply, the pictures on these pages are simply microscopic views of tiny pieces of metal. Called photomicrographs, they show carefully prepared and highly polished metal specimens at about 100 to 1000 times their actual size. Taken by a metallograph, a combination microscope-camera, they were borrowed from the files of Tom Jones' CMB-6 physical metallurgy section.

The metallograph makes it possible for metallurgists to see minute cracks and impurities, judge the quality of welds between metals, and learn much about the makeup of the metals themselves from the shapes and sizes of their crystal-like grains. These are important considerations for Jones' section in evaluating the metals being considered for use in many of the Laboratory's projects, such as reactor and weapon development.

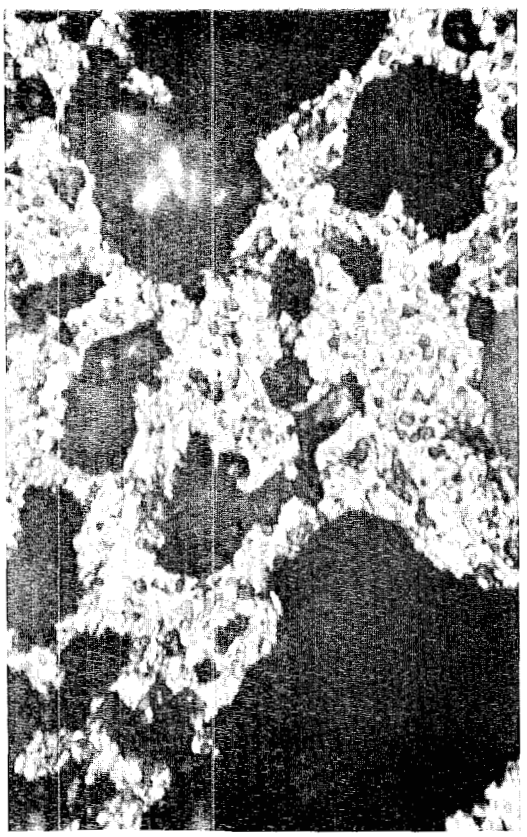
A close up view can tell a lot about whether a certain metal can withstand corrosive chemicals and extreme pressures and temperatures. But it's one thing to look through a microscope and quite something else to remember later precisely what you saw. The photomicrograph is a record the metallurgist can refer to.



Grains of uranium carbide and zirconium carbide, some resembling pears and bananas, magnified a thousand times.



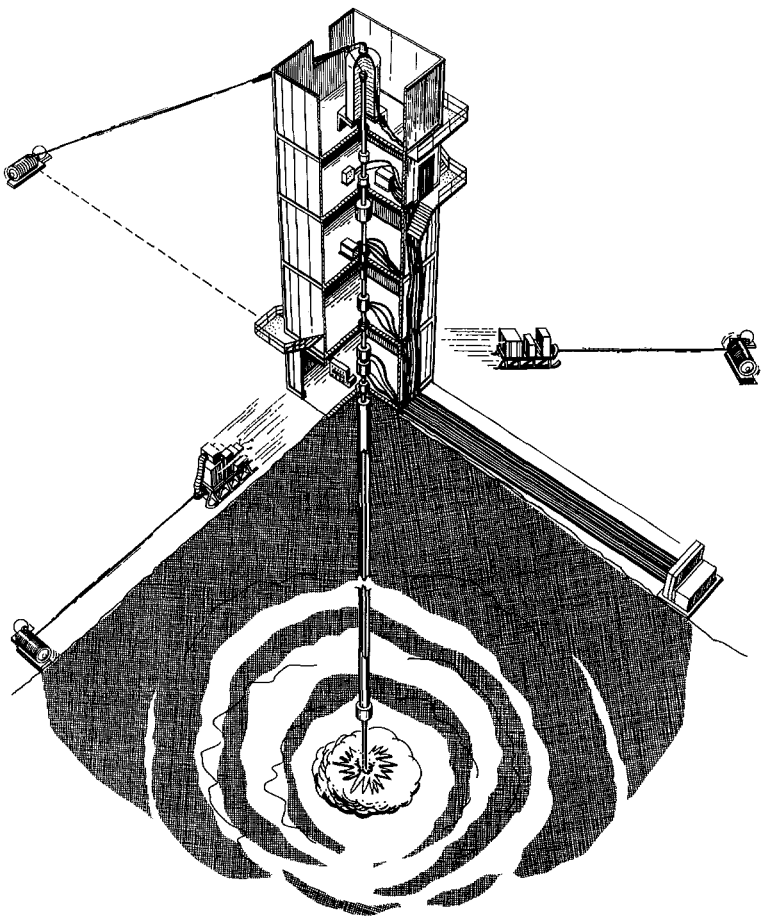
Magnified 500 times actual size, tiny holes can be easily seen in compacted powders of uranium carbide.



Tiny compressed powders form a wierd mosaic in this microscopic specimen. Dark areas are voids where the metal was not compressed properly. The specimen is shown about 200 times its actual size.

Nuclear Explosives: Powerful for Physics

BY EARL ZIMMERMAN



Schematic drawing (not to scale) illustrates "stacking" of apparatus above underground nuclear explosion. Burst provided source of neutrons for physics experiments that otherwise would have taken generations to accomplish.

LASL scientists have demonstrated that a nuclear explosive can be a highly effective tool for physics experiments.

Their scientific application of weapons development—which used a low-yield underground burst as a neutron source—was so successful that physicists say the data they obtained would have taken decades and longer to accumulate by more prescriptive laboratory methods.

The detonation occurred nearly a city block beneath the cold and dusty surface of Yucca Flat at the Nevada Test Site and climaxed months of preparation by a dozen Laboratory groups.

LASL Director Norris Bradbury, who made the public announcement of the pioneering achievement, said that even with the use of computers it will be many weeks and perhaps months before the enormous amount of data acquired during the few milliseconds of the blast can be analyzed.

"But we are quite convinced," Bradbury said, "that the success of this single science application of a nuclear explosive will provide knowledge that would not have been obtainable by other known means within any of our lifetimes."

The buried burst produced neutrons many thousands of times more numerous than is possible with even the most powerful "atom smasher" particle accelerators that are standard equipment in nuclear research installations.

One experiment, W-8 Group Leader Art Hemmendinger has calculated, would have taken 25,000 years to conduct using the best particle accelerator now in existence.

Collimated to a beam 7/16 of an inch in diameter, the intense supply, or flux, of neutrons was put to work on seven distinct experiments as it shot upward from the explosion. The experiments dealt mainly with neutron "cross sections"—physics talk for the probability that reactions will occur when nuclear particles of various energies encounter target material.

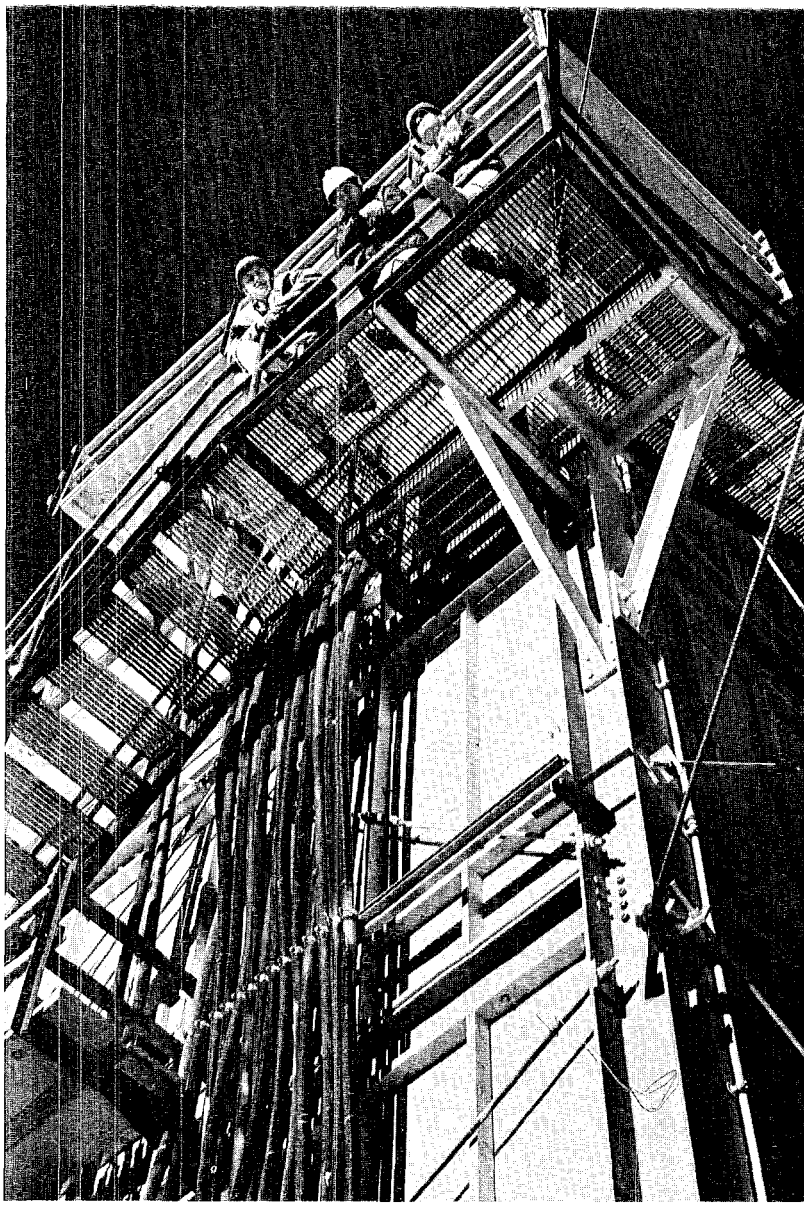
New Tool Research

Neutrons are electrically neutral particles that are an ingredient of the atomic nucleus. They are liberated in great quantities by the fission process. Traveling with high speeds, neutrons frequently strike other atoms, with various reactions --additional fissions, absorption, collision scattering and ionization.

In normal laboratory procedure neutrons are produced by bombarding atoms with particles, usually protons, that are accelerated to high speeds electrically. The resulting fluxes are small and data is obtained slowly. By using the tremendous neutron output of a nuclear explosion the fluxes are so great that several experiments can be run at the same time. It is also possible to do some experiments that would be utterly impossible otherwise, because of background radiation interference.

A 50-foot-high steel tower located directly above the device contained the primary detecting equipment for the Yucca Flat experiments. The tower was some 15 feet square and was enclosed with plywood panels as protection from the capricious Test Site weather. A steel staircase girded the outside of the tower and gave access to the five levels at which experimental apparatus was set up.

The explosive was deposited in a 48-inch diameter hole. The hole was cased with steel pipe ¾ of an inch thick. Just above the device was a vacuum chamber that reached to the top of the tower and provided an unobstructed flight path for the neutrons. Lenses and a series of baffles to create shadows for an optical experiment, the collimator, and the various targets and detectors were mounted inside the chamber. Sixty tons of lead shielding separated the experiments. Attached on the outside of the pipe was the immediate instrumentation of the experiments--all feeding to cables that cascaded down the side of the tower like so much oversize spaghetti. More than 150 signal lines linked the experiments with data recording equipment in trailers 800 feet away.



LASL staffers peer from "porch" at top level of 50-foot-high instrumentation tower that was placed directly above shaft containing nuclear explosive used in experiment.

Atop the tower, acting like a great cork, was a stainless steel tank containing 600 gallons of sodium fluoborate. This solution was a "catcher" for the neutron beam, preventing it from entering the atmosphere. Boron has a high neutron absorption capacity.

"This was no doubt one of the most heavily instrumented physics experiments ever conducted," Bradbury noted. "We are extremely

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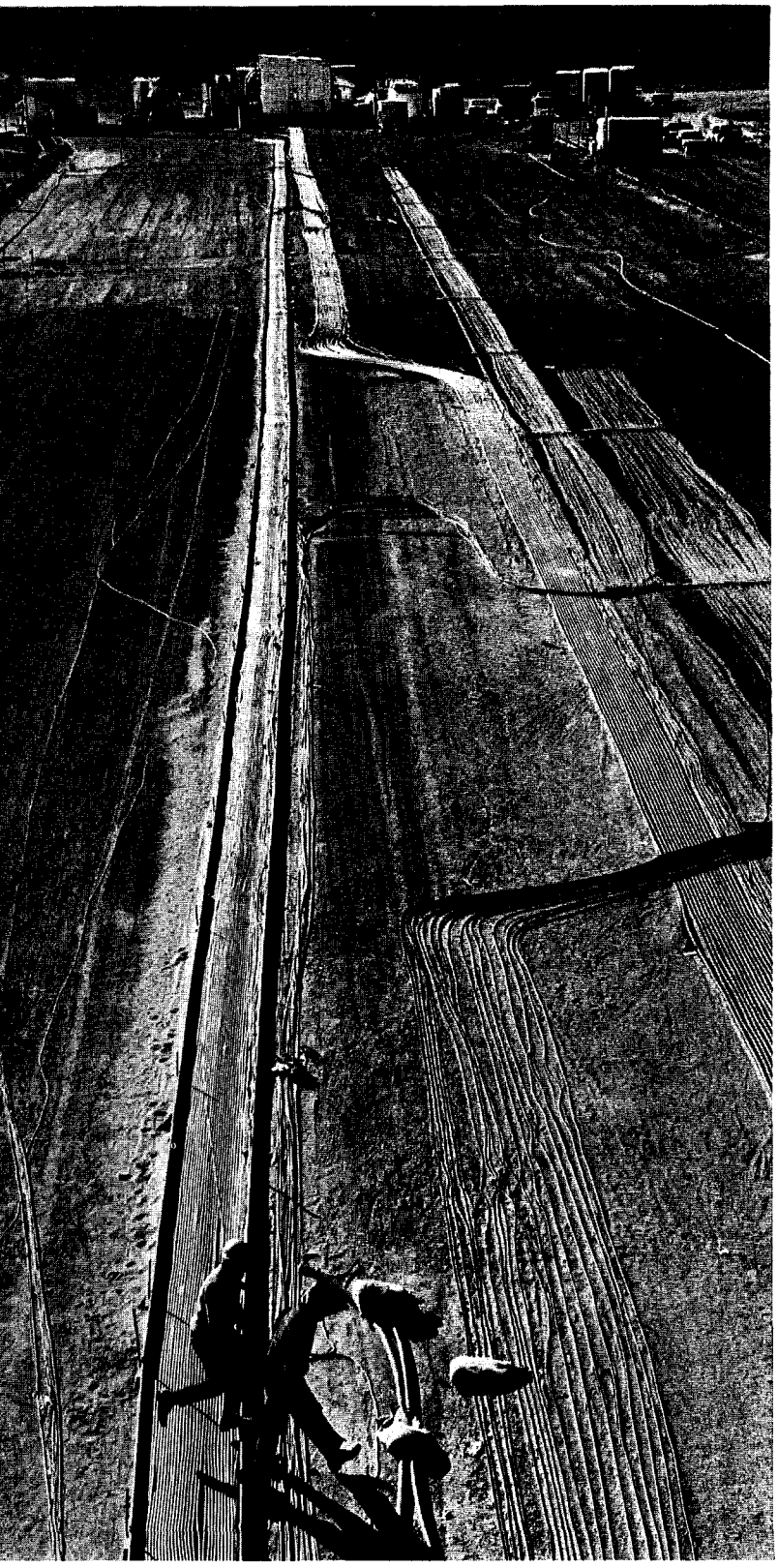


Cables were the arteries that carried signals 800 feet from tower at ground zero, where this photo was taken, to recording trailers.

Nuclear Explosives . . .

Continued from preceding page

pleased that preliminary analysis indicated all the instrumentation functioned as planned."

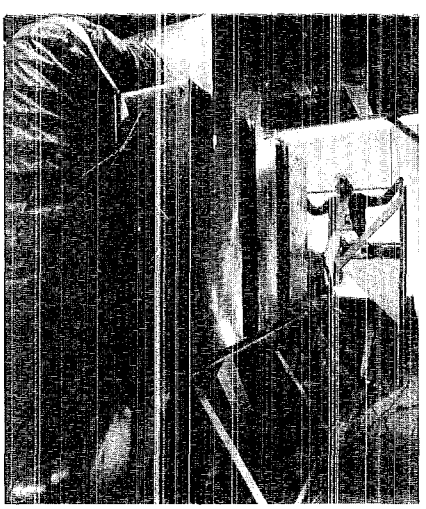
The experiments represented a cooperative effort almost unmatched in Laboratory activity since the early weapons tests. Scores of staff members and technicians from J, W and P Divisions were engaged at the site. Others worked at Los Alamos designing and building equipment. Many persons spent day and night assembling experiments in Nevada and slept on cots in instrumentation trailers.

As in all weapons shots, engineering, construction and firing was supervised by J-7, J-6 and J-8. Robert Campbell and Robert Newman of J-DO were in charge of the general test procedure. Support contractors at the Test Site—Edgerton, Germeshausen & Grier, Inc., Holmes & Narver and Sandia Corporation—all participatd in the readiness. Sandia also conducted some experiments at shot time.

It was expected that the subterranean blast would be followed by collapse of the earth above, and the likely loss of the tower and experiment assemblies. Although much of the equipment was expendable, it was essential to recover some instruments and material. An experiment on foil irradiation, for example, required the world's most highly purified samples of plutonium 242, several other isotopes, and the service of 21 logarithmic amplifiers valued at $25,000; another involved use of high speed cameras to record the speed of the shock and radiation front advancing up the pipe. Recovery of these two ground-level experiments was made by mounting the equipment on large sleds cabled to drums and winches beyond the anticipated collapse perimeter. A steel cannister containing emulsions for spectrum measurements was recovered from the top level with a sling arrangement that lofted the cannister away from the tower and then lowered it to a pad on the ground which was connected to a third winch.

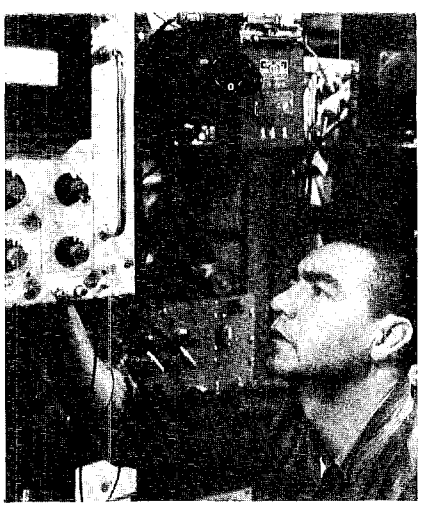
Since the neutron burst and the experiments took place almost simultaneously with the detonation, the recovery drums were triggered to start winding at zero time. All three instrument pack-

J-12 group leader Lee Aamodt uses blackboard in instrument trailer for calculations on liquid helium detector experiment.



Left: Delicate and valuable electronic equipment was installed on this air-conditioned "sled" and pulled to safety immediately after underground explosion.

Right: Johnny Gallegos, J-10 technician, was one of crew responsible for proper installation and operation of dozens of 'scopes and cameras.



ages were pulled clear of the area within 40 seconds. Collapse came 3½ minutes after detonation.

The area was evacuated during the test but it was possible for scientists to return to their recording trailers within three hours. The tower sank into the depression. Automatic disconnects freed the cluster of cables and they dangled loosely over the rim.

Although Los Alamos physicists who conducted the first nuclear explosion nearly 20 years ago visualized their bomb's potential for scientific exploration, it wasn't until now that development of materials and techniques made such experiments possible.

Success at Yucca Flat has made those dreams come true and enthusiastic scientists are already designing equipment for further high-flux experiments.

South-of-the-border goodies resulted from continual bustle in the Chezem kitchen.

An Evening of

Margo Chezem's Language Students Are Treated to an Annual Fiesta

Every winter Curtis and Margo Chezem host a "casa fiesta" for students of Mrs. Chezem's language classes. The party follows a Mexican motif and for the nearly 100 guests—students and parents of students—it is a few hours of authentic Mexican gala.

This season's party was in early December, at the Chezem home on Barranca Mesa. There was a mariachi band, a group of flamenco dancers, Mexican decorations —and an abundance of Mexican food.

Though of German ancestry, Mrs. Chezem was born and raised in Mexico City. She delights in the annual sharing of her native customs. Friends and neighbors help with the parties. Contributions last month included a flight to Mexico, courtesy Bob and Alice Waterman, to purchase mole, spices, tortillas, cheeses, chickens, pottery bowls and other necessities. Mrs. Edith Lyles, a family friend, came up from El Paso with a bagful of ingredients to help make hundreds of tamales. Less glamorous volunteer assistance ranged from spooning out beans to laundering mountains of dishes.

Luminarios and silhouetted mariachi greeted party arrivals.

Mexico

Photographs by Bill Regan

Hostess Margo Chezem reflects guest's good time at the party.

Jolly caballeros—Tom Cooley, Louis Rojas and Jim Dvorak—guffaw at a good one in the party cantina that kept guests in good spirits.

Musicians and decor made a Mexican cafe of the Curtis Chezem home on Barranca Mesa.

Fiesta . . .

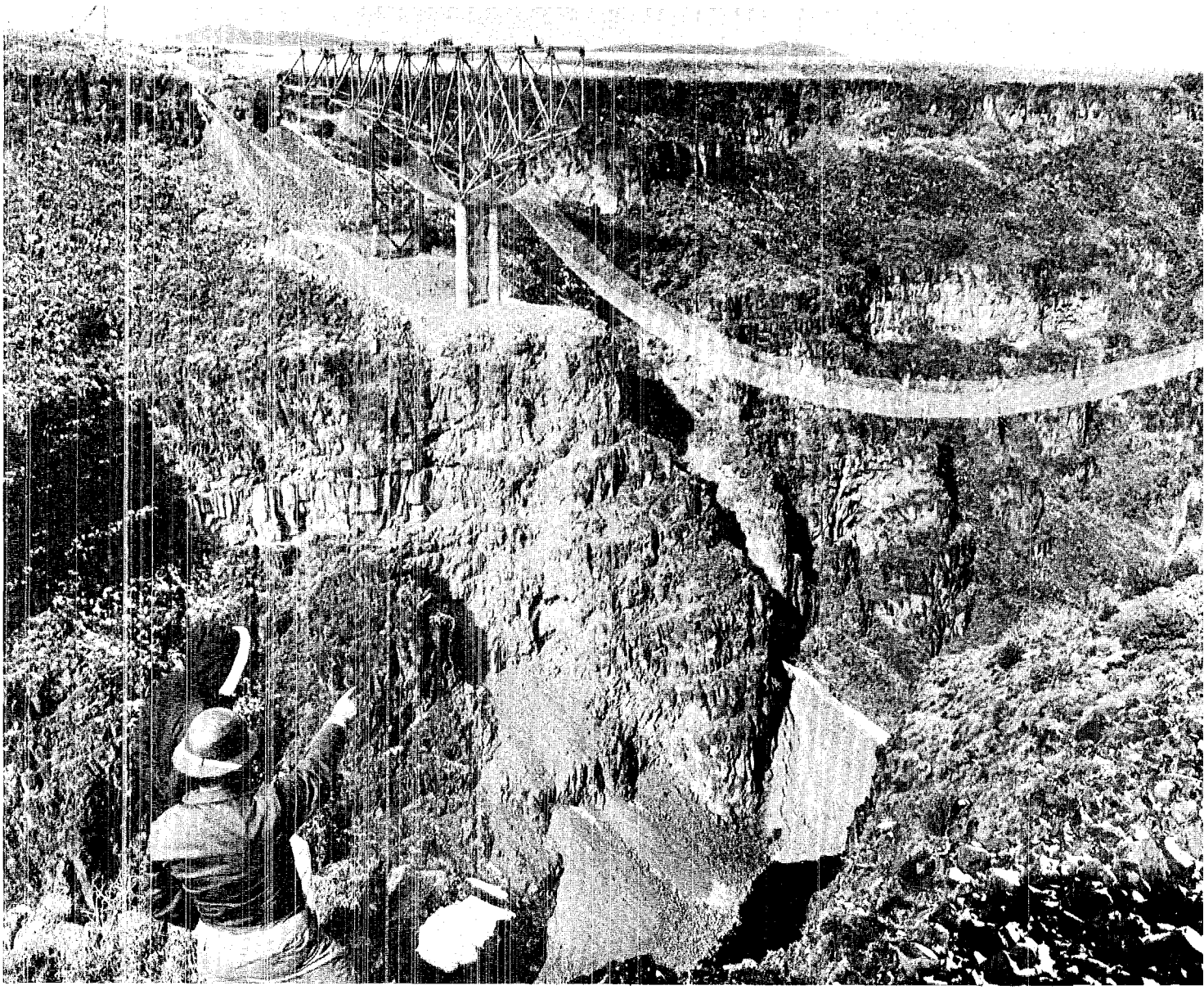
Continued from preceding page

Liz Martin (above) helps out in the kitchen, while (below) other guests relax and enjoy the entertainment.

Guests help themselves at the buffet table, choosing from a variety of authentic Mexican dishes. Much of the food was flown up from Mexico.

A mariachi band from Santa Fe provided the party with a festive touch of old Mexico.

Well after midnight, their party almost over, the tired host and hostess finally find time to eat their dinner.



Construction men view the early stages of the new bridge being built across the Rio Grande Gorge near Taos. The bridge, 650 feet above the river, will be a key link to a new all-paved route across northern New Mexico.

The Rio Grande Gorge Bridge,

A Spectacular Span

Photographs by Bill Regan

A high-level bridge spanning the Rio Grande gorge near Taos will be a spectacular key link in the first direct route cutting across northern New Mexico.

The bridge, now under construction, will be open to traffic next summer. It will cross the Rio Grande at a point where the gorge is 1,200 feet from rim to rim, and where the river cuts its way through

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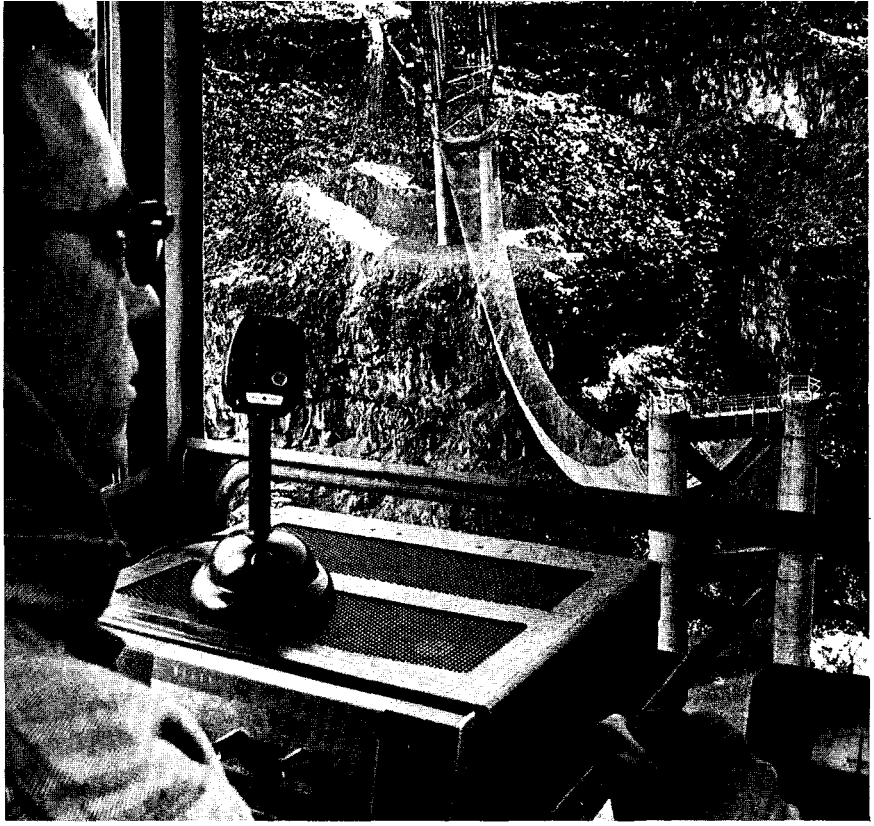
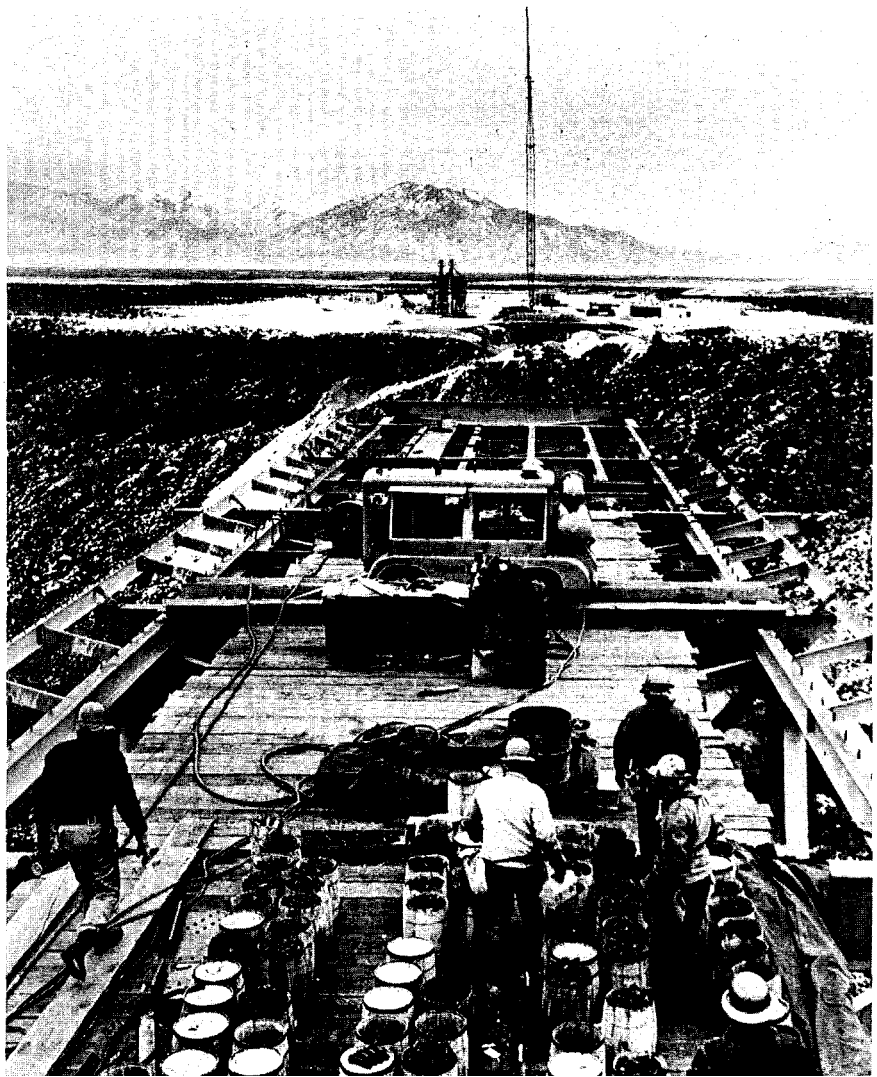


A workman on the east rim of the Rio Grande Gorge operates a suspended platform used to transport men and materials across the wide canyon.



Well supplied with kegs of nuts and bolts, construction men arrive for a day's work high above the Rio Grande.

Bridge . . .

Continued from preceding page

shiny black basalt some 650 feet below.

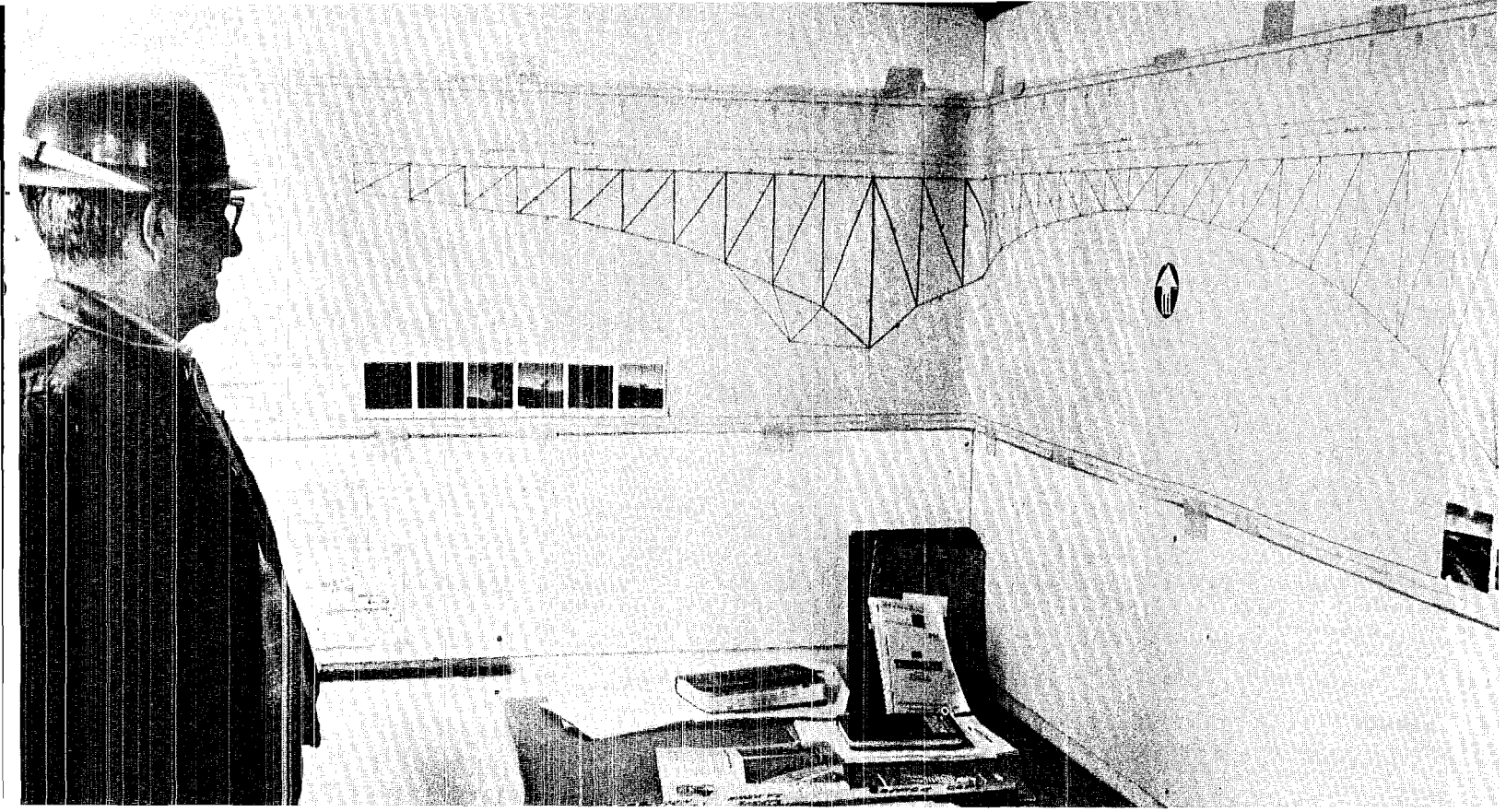
The three-span, continuous steel-truss crossing will be the longest and highest bridge ever built in New Mexico. More than 2,000 tons of steel alone will be used. Steel work, being done by the American Bridge Division of U.S. Steel, includes the erection of a 600-foot center span, and two side spans each 300 feet long.

Work on the bridge is progressing from the west rim toward the center of the gorge. The first 18-ton piece of steel was swung into place early in November. Later on, workers will transfer their operations to the east rim and build the second half of the bridge and make the center connection.

Elmer Cornett, American Bridge construction superintendent at Taos, said about 20 steel workers are on the job, and more are needed. However, he said, good steel men are hard to find. A few have shown up on the job, taken one look at the gorge, and have left, Cornett said. One steel worker was hired, swung across the canyon in the bucket, returned to the east rim, and hasn't been seen since. Cornett said the man left his coat and lunch bucket on the west rim and never returned for them.

Prime contractor for the bridge is J. H. Ryan and Son, Inc., of Albuquerque. Charles E. Reed, New Mexico State Highway Department, and his staff designed the bridge.

When completed, the bridge will be 28 feet wide and will include two lanes for traffic. Four-foot walkways on either side will offer sightseers spectacular views of the deep gorge and river below. Because wind velocities are sometimes extreme in the gorge, the steel



Elmer Cornett, construction superintendent on the Rio Grande Gorge bridge, looks over plans of the structure in his office.

bridge has been designed to withstand 90-mile-an-hour winds.

Main truss members of the bridge are welded box sections fabricated from high-strength steels, making the structure considerably lighter weight than would have been possible a few years ago, Cornett said.

Originally the bridge was to have an open deck, like a giant steel grate, but the highway department decided tourists might become frightened and refuse to cross. So the deck design was changed. The clincher in the design change came when sheep men in the Taos Plateau area noted their sheep could not cross an open deck, and since they are "good taxpayers" they requested a solid roadway so their flocks could cross from one side to the other. The 29,000 square feet of decking will now be filled with lightweight concrete to form the roadway, making both tourists and sheep ranchers happy.

One problem is now apparent. The redesign allows for no drainage ports on the bridge. Since the west side of the bridge will be nine feet higher than the east, Cornett envisions a river rushing across the Rio Grande during cloud bursts, which are frequent in the area during the summer. But he added this problem can still be overcome before completion if the highway department decides to make minor design changes.

New Mexico Governor Jack Campbell believes the $2 million structure will be a tourist attraction in itself. The bridge, along with a section of highway now under construction between Tres Piedras and Tierra Amarilla, may ultimately become an extension of U.S. Highway 64 which begins in North Carolina and ends in Santa Fe. The proposed extension would carry the highway through Las Vegas, Nevada, and on to Los Angeles. Such a highway would lure travelers, vacationers, outdoorsmen, and possibly light industry into northern New Mexico.

Construction workers are transported across the Rio Grande Gorge on this platform which hangs from a cable. The River is seen some 650 feet below.

LASL Bit Melts Its Way Through

BY PETER MYGATT

A LASL-developed drilling bit, which melts its way through solid rock, may be the answer for making holes in the earth to depths impossible by conventional drilling methods.

The bit is the outgrowth of an academic discussion by members of Group CMF-4 about geophysics, particularly Project Mohole where scientists are drilling deep beneath the earth's crust in the Pacific Ocean. The men were discussing methods of melting holes into the earth.

Since CMF-4 (the inorganic and physical chemistry group) studies had been directed toward extremely high-heat transfer problems associated with nuclear rocket research, they decided to put their knowledge to work and build a tool that would melt through rock.

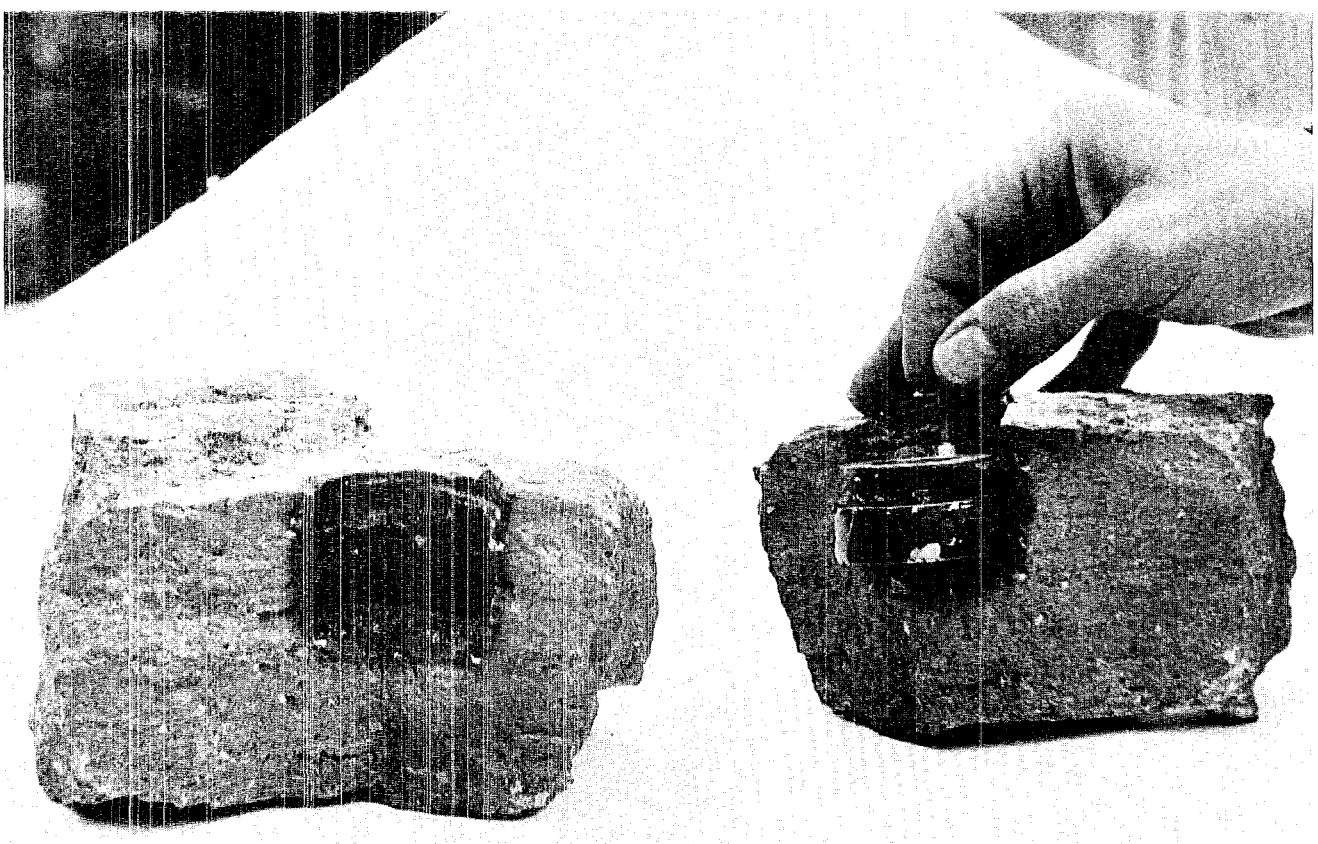
In experiments at Los Alamos, a two-inch diameter bit, heated electrically to 1,200 degrees Centigrade, drilled through basalt at the rate of 50 feet per day. The power source was a portable, five-kilowatt, generator.

Scientists who built the prototype bit—Eugene Robinson, Robert Potter, B. B. McInteer, James Coleman, and Dale Armstrong—calculate that an eight inch bit (about the diameter of a standard oil well rotary bit), using 90 kilowatts of electrical power, could drill through 50 feet of hard rock per day.

One could drill about 100 feet per day by doubling the power and putting a little more pressure on the bit. Potter said the bit becomes more efficient the faster they drill.

The bit is hottest at the bottom, or face, where it comes in direct con-

Split specimen of basalt shows how this LASL-developed bit, heated electrically, melts its way through earth and rock.



tact with the rock. The side of the bit is internally water cooled. Melted rock is extruded upward through a center tube and is flaked away and blown out the top of the shaft. Little force is needed to push the bit through the rock, because there is no bond whatsoever between the water-cooled sides of the bit and the hot, viscous rock.

The cylindrical bit, or "shoe" as the scientists call it, has a tungsten or molybdenum face and wall. Inside the shoe against the bottom of the bit is a boron-nitride electrical insulator which is also an excellent heat conductor. Next to the insulator is a tungsten heating element, then another boron-nitride plate, and finally a backing plate or water-cooled radiator. A single electrical lead heats the element, and the drill itself is the ground or secondary lead.

Though there is little wear on the bit during drilling operations, Potter feels it may have to be coated with very hard iridium or iridium alloys if drilling operations are to continue for a matter of months.

If a drilling technique is engineered using the LASL bit, perhaps the most practical application will be that of sinking large holes to extreme depths (up to 100 miles) where it will be possible to tap and make use of geo-thermal energy—the extreme heat naturally present deep within the earth.

The CMF-4 group believes that drillers of water, oil and gas wells will find it useful when going through basalt, granite, or other hard rock; and geologists may find some application to coring both vertically and horizontally. Potter believes that with some adaptations a knife-like tool might be useful for shaping fine-grain, hard, solid rock.

Robert Potter, left, and B. B. McInteer, both of CMF-4, look over a drilling bit developed by their group. In the foreground is rock used in drilling tests.

James Coleman, CMF-4, lines up a molybdenum drilling bit above a chunk of basalt as he prepares for a test. The bit is the small bottom section of the drill stem shown in photograph.

The Technical Side

American Ordnance Association Space Symposium, Los Angeles, Calif., Nov. 24:

"The Role of Nuclear Propulsion for Space Exploration" by Keith Boyer, J-DO.

Air Force/Public Health Service Off-Site Environmental Study Symposium, Cocoa Beach, Florida, Dec. 1-3:

"The Kiwi-TNT Experiment" by William R. Stratton, N-2.

"Hazard Evaluation for Kiwi Excursion" by Harry S. Jordan, H-8.

American Physical Society Meeting, Berkeley, Calif., Dec. 21-23:

"An Improvement on Koopmans' Theorem" by David Liberman, T-4.

"The $N^{14}(He^3,n)F^{16}$ Reaction" by Chris Zafiratos, Oregon State University (formerly P-DOR, LASL); Fay Ajzenberg-Selove, Stanford University; and Frank S. Dietrich, Haverford College.

"A Quantum- and Correlation-Corrected Statistical Atom Model" by John F. Barnes, T-5.

Talk before St. Louis Society of Analysts, St. Louis, Mo., Dec. 15:

"Analytical Chemistry in Industrial Hygiene" by H. F. Schulte, H-5.

20th Annual Southwest Regional Meeting, American Chemical Society, Shreveport, La., Dec. 3-5:

"Vibrational Analysis of Trivalent Metal Acetylacetonates" by F. H. Kruse, CMF-4, Katheryn E. Lawson, and Bruno Morosin, both of Sandia Corp.

Seminar, Chemistry Dept., University of New Mexico, Albuquerque, Dec. 4:

"The NMR Spectrum of Single Crystal D_2O" by Sherman W. Rabideau, CMF-2.

Seminar at University of Kansas, Dec. 14:

"Neptunium and Plutonium Borides" by Harry A. Eick, CMF-5 Consultant.

Seminar at Johns Hopkins University, Baltimore, Md., and Colloquium at Howard University, Washington, D.C., Dec. 9:

"Some Nuclear Direct Interactions Induced by He^3 Particles" by A. G. Blair, P-12.

American Geophysical Union Meeting, Seattle, Wash., Dec. 28-30:

"Introduction to the Scientific Results from the Vela Satellite Program" by Harold V. Argo, P-4. (Invited Paper)

"Solar X-Ray Measurements" by J. P. Conner, W. D. Evans, M.D. Montgomery, S. Singer, and E. E. Stogsdill, all P-4. (Invited Paper)

"Satellite Measurements of Intensity Fluctuations of the Cosmic Ray Flux Near 17 R_E" by J. R. Asbridge, S. J. Bame, H. E. Felthauser, and R. A. Olson, all P-4. (Invited Paper)

"Observations of Penetrating Electrons (>40 KeV) on the Dark Side of the Earth's Magnetosphere" by S. Singer, J. P. Conner, D. E. Michael (Sumer Student), and E. E. Stogsdill, all P-4. (Invited Paper)

"The Flux and Energy Distribution of Electrons (>50 KeV) Observed with a Silicon Surface-Barrier Detector and GM Tube" by M. D. Montgomery, and E. E. Stogsdill, both P-4. (Invited Paper)

"Positive Ion Angular, Spatial, and Energy Distributions as Measured Near R_E by an Electrostatic Analyzer (0.3 to 20 KeV)" by L. B. Strong, J. R. Asbridge, S. J. Bame, H. E. Felthauser, and R. A. Olson, all P-4. (Invited Paper)

"Electron Angular, Spatial and Energy Distributions, Measured near 17 R_E with an Electrostatic Analyzer (0.3 to 20 KeV) and a GM Tube (>50 KeV)" by S. J. Bame, J. R. Asbridge, H. E. Felthauser, R. A. Olson and I. B. Strong, all P-4. (Invited Paper)

"A Measurement of the Flux in Selected Solar X-Ray Emission Lines in the 16-40 A Spectral Region, Using Low Altitude Rockets" by H. V. Argo, P-4, James A. Bergey, P-1, Burton L. Henke and Michael D. Montgomery, both P-4.

IAEA Symposium on Inelastic Scattering of Neutrons, Bombay, India, Dec. 15-19:

"Dispersion Curves for Phonons in Diamond" by J. L. Warren, R. G. Wenzel, and J. L. Yarnell, all P-2.

Presentations at Rice University, Houston, Texas: IEEE Student Branch*, Dec. 8; Graduate Electrical Engineer Colloquium, Dec. 9:**

* "Design and Analysis of Circuits Used in Digital Computers" by Allan F. Malmberg, T-7.

** "Mathematical Basis of the NET-1 Network Analysis Program" by Allan F. Malmberg, T-7.

DASA Conference on Nuclear Weapons Effects on Reentry Vehicles and Interceptor Missiles, Aerospace Corp., San Bernardino Calif., Dec. 2-4:
(CLASSIFIED MEETING)

"Structural Response of a Hardened Reentry Vehicle to a Nuclear Shock" by Richard A. Gentry, T-3.

University of New Mexico, Mechanical Engineering Dept., Albuquerque, Dec. 3:

"Significance of Thermal Problems in Nuclear Rocket Reactors" by John A. McClary, N-3.

NEW HIRES

Elwin Orville Beckwith, Los Alamos, P-11 (Casual).

Beverly J. Agnew, Los Alamos, P-DO (Rehire-Casual).

Frank W. Clinard, Jr., San Francisco, Calif., CMF-5.

Ralph W. Kewish, Jr., Baton Rouge, La., P-16.

Charles Edward Stiles, Norman, Okla., K-4 (Rehire).

Faith Irene Stephens, Los Alamos, PUB (Rehire).

John Skalyo, Jr., McKees Rocks, Pa., GMX-4.

Richard J. Imprescia, Hayden, Ariz., CMF-13 (Rehire).

Phyllis Benzel Norman, Los Alamos, P-10 (Rehire-Part Time).

Kathryn L. Brown, Los Alamos, D-6 (Part Time).

William Francis Carlson, Bristol, Conn., J-17 NRDS.

Buckley D. Lupardus, Kansas City, Mo., ENG-3.

James Eugene Pallone, Ft. Wayne, Ind., ENG-3.

Joyce Ann Harvey, Los Alamos, PER-3.

Ida Mae Antos, Los Alamos, H-2 (Rehire-Casual).

For Reporting Change of Address

Previous Address

If your address has changed please inform THE ATOM by clipping and filling out this coupon. Print or type your name and both your old and new addresses.
Mail to: Mail and Records, Addressograph
Los Alamos Scientific Laboratory
Box 1663
Los Alamos, N.M. 87544

name

address

city state zip code

New Address

address

city state zip code

WHAT'S DOING

LITTLE THEATRE: "John Brown's Body," *stage adaptation of Stephen Vincent Benet's* epic poem about the Civil War. Produced jointly with Los Alamos Choral Society. Tickets, $1.75 adults, 75 cents students, or $5 season tickets available at the door.

Friday, Saturday, January 15, and 16, 8:30 p.m., Civic Auditorium.

JUNIOR MISS PAGEANT: Sponsored by the Los Alamos Jaycees. Final judging to select "Junior Miss of Los Alamos" from a group of contestants who are local high school senior girls. Winner will go to state pageant to compete with 12 other girls for the title "Junior Miss of New Mexico."

Friday, February 5, 7:30 p.m., Civic Auditorium. Admission: $1.50 adults; $1 for students.

OUTDOOR ASSOCIATION: No charge; open to the public. Contact leader for information on specific hikes.

Saturday, January 9, Camp May to Pajarito and return. Leader, Don Rose.

Saturday, January 23, Camp May—Pajarito—Valle Canyon. Leader, Terry Gibbs.

Saturday, February 6, Camp May to Los Alamos via pipeline road. Leader, Ken Ewing.

FILM SOCIETY: Civic Auditorium. Films shown 7 and 9 p.m. Admission by season ticket or 90 cents single admission.

Wednesday, January 20, "Billy Liar," a British comedy.

Wednesday, February 17, "Rasho-Mon," Japanese drama.

LOS ALAMOS SKATING ASSOCIATION: Schedule for use of local ice rink.

Mondays: General skating, 3 to 5 p.m., 7 to 9:30 p.m.

Tuesdays: "Ladies and Tots" session, 9:30 to 11:30 a.m.; general skating, 3 to 5 p.m.; adults only from 7 to 10 p.m.

Wednesdays: General skating, 3 to 5 p.m., 7 to 9:30 p.m.; hockey practice, 9:30 to 10:30 p.m.

Thursdays: "Ladies and Tots" session, 9:30 to 11:30 a.m.; general skating, 3 to 5 p.m.; Figure Skating Club, 6 to 7:30 p.m.; adults only from 7:30 to 10 p.m.

Fridays: General skating, 3 to 5 p.m.; "Game Nite" (primarily for teenagers), 7 to 10 p.m.

Saturdays: Hockey during the morning; general skating, 2 to 5 p.m. 7 to 10 p.m.

Sundays: Professional lessons, 10 a.m. to 1:30 p.m.; general skating, 2 to 5 p.m.; Figure Skating Club, 6 to 7:30 p.m.; adults only, 7:30 to 10 p.m.

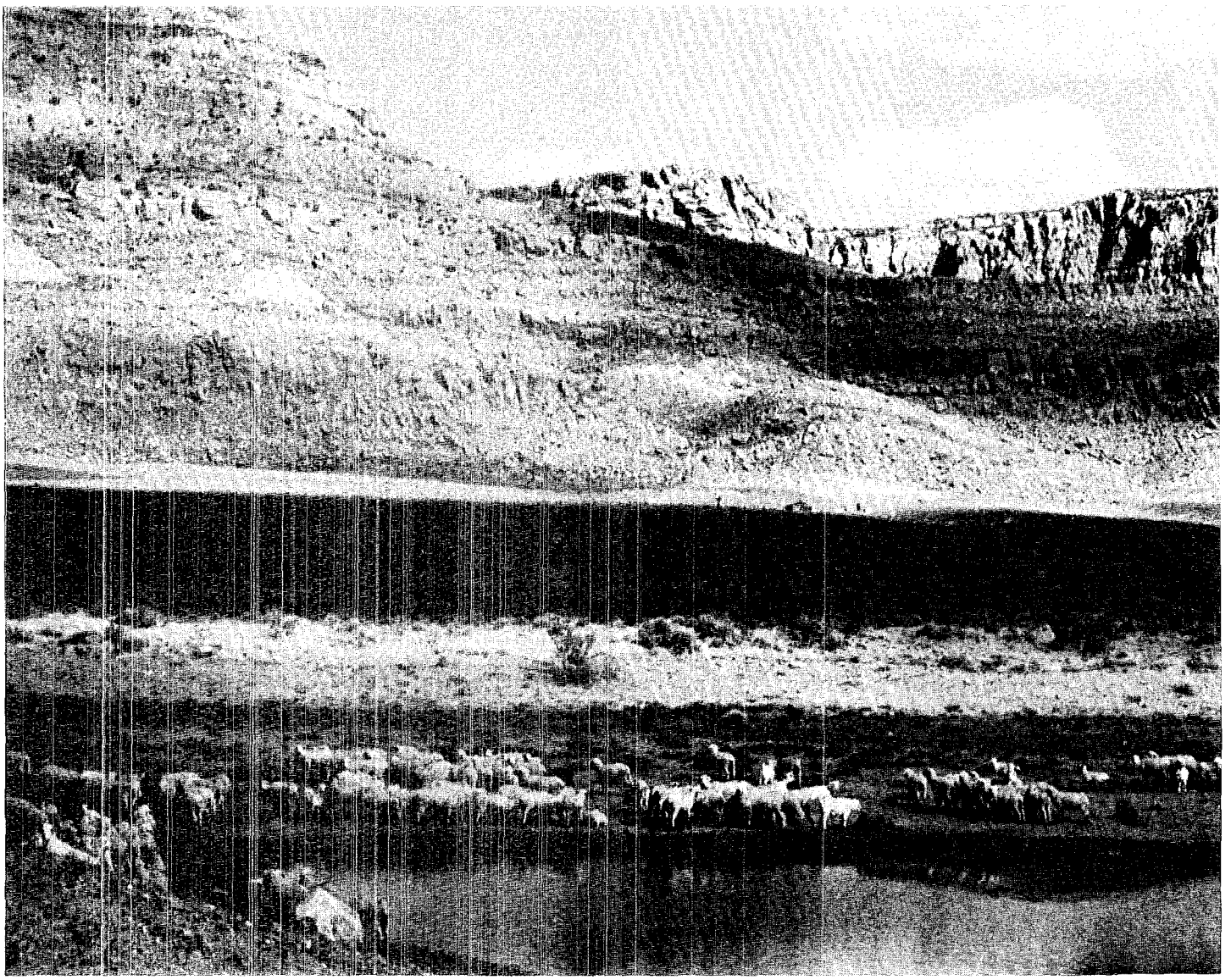
The Revolution in

If it has been a few years since you last visited the Navajos, near-neighbors of Los Alamos to the north and west, you have a great big surprise in store for you. Where deep-rutted tracks used to wander aimlessly through the sand dunes and sagebrush, paved highways now criss-cross the reservation.

Where lonely trading posts were once the only even halfway modern buildings in sight anywhere, huge complexes of government schools, hospitals, dormitories and staff residences have arisen as if by magic in a score of hitherto isolated places.

The Navajos themselves, emerging as if from a hundred-year sleep, are surging into the 20th Century. They are building motels, restaurants, service stations and other tourist facilities all over the reservation, along with parks, campgrounds, fishing areas and roadside picnic stops. They have built and operate a large sawmill. Their young men are working for good wages in the big oil, gas, coal and uranium processing industries which have sprung up on leased reservation lands.

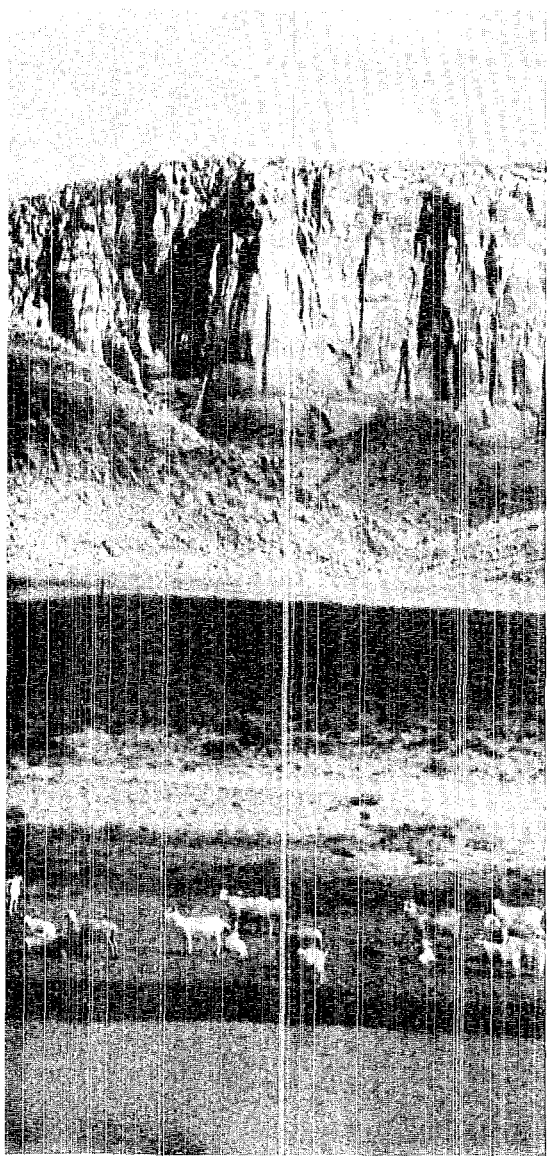
The Navajo Tribal Council has



Navajo Land

BY JOHN YOUNG

chosen to use the revenues from all these enterprises to build up permanent business and industries in which the people can find jobs, rather than taking the short-term benefits of distributing the money as a dole. The tribe has become dedicated to education to such an extent that better than 90 per cent of the school age children on the reservation are attending school somewhere—in trailer classrooms scattered through the remote regions of the reservation, in government day schools or boarding schools at such centers as Tuba City, Window Rock, Kayenta, Dennehotso, Chinle and a dozen others, in mission schools on and off the reservation, and in public schools in cities on all sides. Total school attendance for all types of schools is estimated to be in excess of 32,000, nearly one third of the tribe. The Tribal Council has established a $10 million scholarship fund to assist gifted children in going on to college. Adult education is gaining in popularity. School buses are a common sight, on the good new roads and on the bad old ones as well.



A flock of Navajo sheep and goats at a roadside pond, representative of the old way of living that is now rapidly changing on the reservation.

Navajo Highway 1, also called the Navajo Trail, is now paved all the way from the turnoff on the Flagstaff-Cameron-Page highway near Tuba City through Kayenta to the Four Corners, and thence to Cortez to the north or to Shiprock to the east. The Cortez-Four Corners highway, which also provides access to the Four Corners Monument and picnic area, continues south to Chinle and Canyon de Chelly, emerging at Ganado on Navajo Highway 3. Navajo 3, paved several years ago and now being rebuilt, runs from Tuba City southeast through the Hopi villages to Ganado and Window Rock, reaching U.S. 66 at Gallup.

From Kayenta on the Navajo Trail, now a booming tourist center as well as a major school and hospital hub, an excellent paved highway runs straight through Monument Valley to Mexican Hat,

Two Navajo girls found much of interest in the Los Alamos Scientific Laboratory exhibit at the Navajo Science Fair at Window Rock in 1963, attended by hundreds of school children from all over the reservation.

where it crosses the San Juan River and enters Utah at Bluff. Other major tourist attractions in Utah and Colorado can be reached from there on state highways. Some of the world's most spectacular scenery, until recently limited to adventurers with jeeps, is now accessible to anybody's Aunt Lydia in her new Cadillac.

The Navajos have ambitious plans, some of them already being put into operation, for developing recreation facilities for the tourist trade all along their western borders on Lake Powell, the Grand Canyon, and the Little Colorado River. In the rugged and until recently virtually trackless Lukachukai Mountains on the western side of the reservation, they are developing fishing lakes and campgrounds. Roadside rest stops and picnic shelters have already been erected every 10 miles or so along both Highway 1 and Highway 3. All have shaded tables and stone fireplaces; a few have water.

More elaborate facilities have been or are being installed at the

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Navajo Land . . .

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several tribal parks, in Monument Valley, Tsegi Canyon, Navajo Mountain, Little Colorado River Gorge, Kinlichee (Anasasi ruins), and at Window Rock.

Six miles south of Fruitland (between Farmington and Shiprock) Morgan Lake, named for a Navajo leader, is producing multiple benefits. The lake is an artificial pond formed by the cooling water from a huge coal-fired, steam-electric plant erected by the Arizona Public Service Company. It burns Navajo coal mined on the spot, provides jobs for Navajo workers, and is attracting tourists for year-around warm-water fishing and aquatic sports. The Navajos are planting trees and installing picnic facilities on the lake, and will sell you a fishing permit. The steam plant is shaking up the industry, incidentally, by providing power at 4 mils per kilowatt hour instead of the 6 mil power cost at Glen Canyon Dam.

All of this has not happened overnight, but it will seem that way to the visitor who made his last bumpy and dusty trip across the reservation prior to about 1962. Now the trip is like reading history while the pages are being printed in front of your eyes.

The Navajos are still making fine rugs, inlaying silver jewelry with turquoise, and following the ancient customs with chants and sandpaintings, but they have also opened their arms and their cash registers to the tourists flocking over their new highways. A visit to the tourist center and museum at Window Rock will be rewarding in maps, literature and exhibits. (LASL exhibited at the Navajo Science Fair at Window Rock in 1963 and plans to do so again in 1965 in the interests of the advancement of science education).

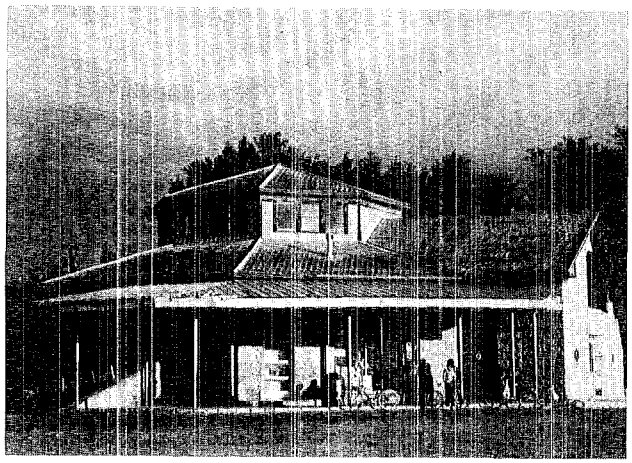
At the museum you will find in detail the story of the emergence of the Navajo. In 1868, returning from 4 years of captivity as prisoners of war, they numbered less than 8,000 —an abject, defeated and poverty-stricken people. Today they number 104,000—the largest and fastest growing Indian tribe in the nation. They are turning their enormous capacity for adaptation to making money in the white man's fashion, and having fun doing it.

As big as any of 10 states, the 16,000,000-acre reservation in Arizona and New Mexico is by no means all sand and rocks. It contains some high mountain ranges, deep forests, lakes and streams, and some of the geologic wonders of the world. It is full of surprises for the most jaded motorist. (Shiprock and Window Rock, the best jumping-off places for reservation tours, are each about 250 miles from Los Alamos, over good highways.)

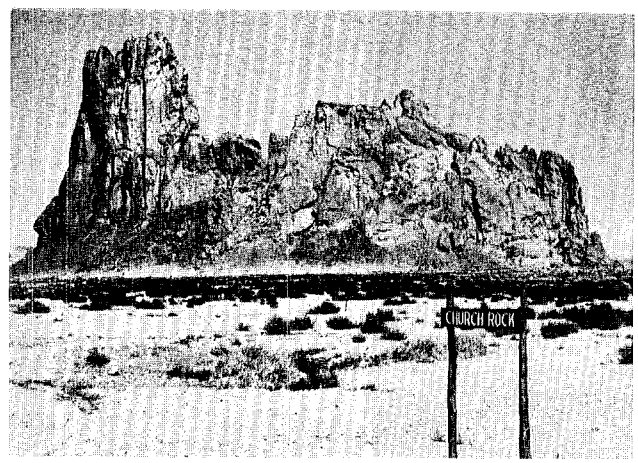
Probably the best evidence of all that a real revolution is going on in Navajoland is in the fact that two young Navajos got themselves elected to the New Mexico State Legislature in November. Monroe Jymm of Gallup and James Etsitty of Shiprock are not only the first two Navajos to make the Legislature, but also the first Indians of any tribe to be so recognized in the Southwest.

Since most of New Mexico's 32,000 Navajos are not registered, the candidates first had to get them signed up, then explain (in Navajo) just what a state representative is—and there are no words in the Navajo language for "state representative." So they settled for something equivalent to "our boy," and won.

The old trading post at Tuba City, the western "capitol" of Navajo land, now a booming center of tribal activity with modern schools, hospitals, and a recreation center.



The vast Navajo reservation includes some of the world's most fantastic scenery. The tribe is now beginning to capitalize on its attraction to tourists.



A childish attempt to fake an Indian petroglyph? A primitive rock drawing of a bird or animal? It is neither of these, but the scratches produced on a basaltic boulder in White Rock canyon, below Pajarito Acres, by wind-blown branches of a shrub. The picture is upside down, and is nearly actual size. Photograph by John Young.

Henry T. Motz
3187 Woodland
Los Alamos, New Mexico